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THE STUDENT'S DARWIN

The Student's Darwin. By Edward B. Aveling, D.Sc., Fellow of University College, London. International Library of Science and Freethought. Vol. II. (London: Annie Besant and Charles Bradlaugh, 1881.)

SEVERAL months ago we reviewed the first volume of this series, and now in reviewing the second we are still of opinion that the promoters of the series are mistaken, so far as they may have the interests of science at heart, in associating their endeavours to render science popular with their systematic onslaught against theistic belief. In itself science has no necessary relation to any such belief; it is neither theistic nor atheistic; it is simply extra-theistic. It is but an extension of common experience, and as such has to deal only with the facts of ordinary knowledge without at any point being able to escape from the sphere of the phenomenal; in so far as any inferences are extended from this domain they are not scientific but metaphysical. Therefore, although it may be of use in the interests of "Freethought" to represent science as not merely neutral but negative in its bearings upon religion, the attempt to do so is detrimental to the interests of science; so far as it may be successful it can only tend to increase the suspicious dislike of scientific knowledge which large masses of the general public are already too apt to harbour. Still, as the leading object of the "International Library" is no doubt that of advancing anti-theistic dogma, its promoters are probably careless whether in so doing they are either loyal or just to the cause of science, under whose banner and in whose name they profess to march.

But beyond recording our dissent from the unreasonable and, from our point of view, pernicious association of "Science" with "Freethought" which is being carried through the "International Library," we have nothing further to do with this matter; in these columns we have only to deal with the science, and so shall not again refer to the freethought, although it may be noted as a curious illustration of the contrast between "the solid ground of nature" and the quicksands of speculative thinking, that one of our most recent reviews was that of a book by Dr. Lauder Brunton, who is certainly no less an authority in science than Dr. Aveling, and whose whole object was seen to be the exact reverse of that which appears in "The Student's Darwin,"—viz., to show that Darwinism is *not* opposed to theism. For ourselves, it is needless to add, we hold that the theory of evolution resembles all other scientific theories in having no point of legitimate contact with any ulterior question of metaphysics, further than that of removing from metaphysics certain erroneous arguments previously based upon imperfect knowledge.

Dr. Aveling has been a diligent student of Mr. Darwin's books, and on reading his epitome of them, even in the most cursory way, one is more than ever amazed at the enormous fertility of Mr. Darwin's work. At every page one feels how meagre the epitome is—often little better than an index—and yet for more than 300 pages the index runs on showing as in a sketch what the mind of one man has accomplished, till the reader who is able to

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remember how many and minute are the details which the index embraces is glad to agree with an introductory remark of the writer, "It is well that all of us should know at least the outline of the work that has been done by this man. For as the name of Chaucer marks the fourteenth, and the name of Shakespeare the sixteenth century, so probably will the name of Charles Darwin mark the nineteenth century in the years to come."

The object of the "Student's Darwin" is thus, as its author says, to furnish a brief summary of the main results of Mr. Darwin's labours, and as the abstract has on the whole been well made, it ought to be found useful for any one who has not time to read for himself the originals. It would have been desirable to have gone less into mere description of species, and more fully into the theory of their origin; for no one who is likely to read the book will profit by the former, while the chief object of the "Student's Darwin" ought to be that of rendering a careful and complete abstract of Darwinism. Yet this is far from being the case in the book before us. When, for instance, we have the arguments from Classification, Morphology, Development, and Rudimentary Organs all compressed into less than two pages, it is evident that the analysis is becoming much too scanty; and in fact no one depending for his information upon this analysis alone could form any just idea of the mass of evidence in favour of evolution and natural selection which Mr. Darwin has collected. This fault is the less pardonable, because it cannot be pleaded in excuse for it that the author is pressed for space, seeing that throughout the book he every here and there devotes a paragraph or two to bad attempts at "fine writing," which, besides being blemishes from a literary point of view, absorb a number of pages which might have been profitably devoted to a further exposition of what he properly terms "the *magnum opus*."

Dr. Aveling, however, everywhere exhibits a just estimate of Mr. Darwin's powers, as a few quotations may suffice to show. "From these pages" (i.e. those of the Monograph of the Cirripedia) "the student will turn with renewed reverence for the great generaliser, who is so patient and so completely master of detail." "Preconceived notions are not for him. He states the arguments for the conclusions that would strengthen the position of the great theory of evolution only less clearly than he states those that tell against that theory. No man was ever more of judge than he; no man was ever less of advocate. . . . The obligations of Charles Darwin to other workers in the same field as himself are always paid with a cordiality and courtesy that must be as gratifying to them as they are natural to him." "Only thirty-four years and the man who has produced the new thoughts is still among us! To-day they form part of the accepted creed of scientific thinkers. . . . To those who remember how few of the great have beheld with their own patient eyes their own greatness in some faint degree recognised during their own lives, their own thoughts accepted as true guides by the thoughtful, assuredly there is cause for comfort here." "Looking back over them again" (i.e. the whole series of works), "we cannot fail to be impressed with those two large attributes of genius that are especially his—unrivalled powers of observation, unrivalled powers of generalisation. And the homage that we pay him

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to-day is, I am assured, but the feeblest of utterances as compared with the heartfelt gratitude and wondering praise that will be the reward of this great thinker in those future times when the very lowliest in the land shall have full grasp of the meaning of his teaching," &c.

On the whole, the "Student's Darwin" deserves to be successful in its object of popularising Mr. Darwin's work. The great bar to its usefulness will be its needlessly aggressive tone towards religion, which is sure greatly to lessen a circulation which it might otherwise have had.

GEORGE J. ROMANES

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Tebbutt's Comet—Origination of its Proper Light

WHILE there seems now no doubt that the honour of being the discoverer of the great comet of 1881 belongs without question to that life-long and most persevering observer, as well as successful computer, of comets, in Australia, Mr. John Tebbutt, three communications which chance to have arrived here this morning from different countries contain most diverse ideas of the nature of that portion of the comet's light which universal spectroscopic observation proves is inherent to the comet itself, indicating the existence there of carburetted gas of some kind, and is quite distinct from the concomitant weak reflection of solar light.

1. In Abbé and Chanoine Moigno's *Les Mondes* for August 25, that excellent physicist in Paris, M. Jamin, is represented as stating that the comet's carburetted gas could be rendered "properly" luminous only in two modes, viz., either by combustion or electric discharges. "If by combustion," says he, "how did it first take fire? what keeps up the fire perpetually? and how are the materials of the comet kept, in such a fire, from becoming red-hot, and then giving out quite a different spectrum to any that has yet been observed?" Wherefore he concludes that the cause of the "proper" light of the comet is the illumination of its constituent molecules by electric discharge, as in the gas-vacuum tubes of our laboratories.

2. But next comes a pamphlet from that accomplished spectroscopist and astronomer, Prof. C. A. Young of Princeton, New Jersey, U.S., setting forth that the bands of carburetted gas seen in the comet's spectrum do most admirably and exactly agree with the combustion-bands of coal-gas and air, as seen in a Bunsen-burner or a blowpipe flame, or in the blue base of all carbo-hydrogen flames known; while they do, on the contrary, most eminently, markedly, and distinctly disagree from the bands of the spectra of the same gases as seen in gas vacuum-tubes when illuminated by electric discharge. And this conclusion of the eminent American physicist is confirmed by a pamphlet just received from M. Fiévez, the spectroscopic observer of the re-organised Royal Observatory of Brussels; as was also announced at the very time of the comet's appearance by the present most acutely observing Astronomer-Royal at Greenwich.

3. What then! Is M. Jamin's theory of the comet's proper light being entirely due to electrical illumination utterly overthrown, and the celestial phenomenon given over to a process of combustion, the mere mention of the necessary details of which suffices to show it ridiculous and impossible?

4. Not yet, I venture to think. We ought to discriminate in such a case most carefully between electricities of different intensities and different temperatures. Something too of that kind, and even much to the purpose of this cometary case, I had the honour of setting forth to the Royal Society, Edinburgh, last year, in a paper which is now being printed for their *Transactions*. For it was shown therein that, when using an induction-coil capable of giving sparks of such intensity as to be five inches long in the open air, a gas vacuum-tube of olefiant gas showed only the carburetted bands which Prof. Young alludes

to as being absolutely *not* the bands which the spectrum of the comet exhibited. But when a smaller coil was employed, and more particularly when its outer helix of long thin wire was replaced by another of short thick wire (specially prepared for the experiment), and the sparks thereby lowered in intensity to such a degree as from 1'3 of an inch, to be capable of only passing through 0'2 inch of air, then, when employed to illuminate the same olefiant gas vacuum-tube, besides the bands seen before (but now more faintly), another set of bands appeared, which were exactly those of the combustion of coal-gas and air, of Bunsen burners, blowpipe flames, blue base of all carbo-hydrogen flames, and finally—*teste* Prof. C. A. Young, M. Fiévez, the Astronomer-Royal, W. H. M. Christie, and others—of Tebbutt's great comet of 1881.

5. From this condensation of testimonies I presume that no other conclusion is to be drawn than that the electrical discharges permeating the whole length of a comet's tail must be something exceedingly weak in intensity;—and the gentlemen who employ electrically lit-up gas vacuum-tubes in their laboratories must do their spiriting with them in future much more gently, if they would really arrive at what goes on in cometary existences. The following exception, too, duly mentioned by Prof. Young, to his general rule, seems to tend in the same direction. For he states "that while the evidence as to the identity of the flame and comet spectra is almost overwhelming, the peculiar ill-defined appearance of the cometary bands at the time of the comet's greatest brightness is, however, something which he has not yet succeeded in imitating with the flame spectrum."

6. "Certainly not," we may add to this most honest confession; for as the comet's greater brightness near its perihelion passage could hardly be due to anything else than a temporary increase in the intensity of its illuminating electric currents, that would tend to bring out the *tube-set* of carburetted bands to interfere with, and spoil the neatness and sharpness of, the so-called *flame-bands*, and would certainly imply a quality or temperature which does not exist in any known simple flame, but is found in the spark of even the smallest induction coil, unless some special means are taken to damp down its intensity.

I have long wished at this Observatory to try a whole course of electric illuminations, as of the old friction machine, Holtz's machine, modern dynamo-machine, coils in variety, and whatever is capable of giving out electricity in any visible luminous shape; but the state of miserable starvation in which this Royal Observatory, Edinburgh, is kept throughout all its branches by Government, and their continued neglect of the applications of their own "Board of Visitors" to "endeavour to obtain justice to this Observatory"—the very words of the last public remit from the Board-meeting, of which the venerable Duncan McLaren, then M.P. for Edinburgh, was chairman—prevent any important apparatus being purchased, or even obtained on loan, to prosecute the inquiries which the science of the times demands.

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Royal Observatory, Edinburgh, August 29

Schaeberle's Comet

SINCE my last remarks I have had an opportunity to examine this fine object with the 6" Cooke equatorial. On Wednesday evening, the 24th, simultaneously with the Great Bear stars, it was easily seen as soon as twilight set in, near the horizon and considerably more to the west than on the 21st. With a comet eyepiece it presented, in spite of its low altitude, a sharp and well-defined figure. The nucleus was stellar-like, with, I thought, a still brighter minute central point. No jets of light proceeded directly from it, but it appeared surrounded by a circular nebulosity of greater extent than the base of the tail, and giving the headed form to the comet frequently seen in old drawings of these objects. The tail was straight, long, and luminous, with a central ray of condensed light which gave it a cylindrical look. When first examined three small stars were involved in the tail without any apparent diminishing of their brightness; while two others below served to define the limit of the tail's visibility in the comet eyepiece. This measured two degrees only, but both it and the nucleus were of a peculiarly fine pale blue tint. I send a drawing of the telescopic appearance of the comet at 8h. 40m. On the nights of the 27th and 28th the comet was again examined at about 8h. 30m. Under a lower power Kellner the appearance was that of a round comet with a central